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Hanging by a thread—urgent coronary artery bypass grafting for ST elevation myocardial infarction in a patient with isolated left main coronary artery disease

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ABSTRACT

A 78-year-old man presented with a left main stenosis as the culprit lesion in an acute myocardial infarction. He had no significant narrowing in any other coronary territory. This case describes findings in an isolated left main myocardial infarction and discusses appropriate treatment strategies.

KEYWORDS Coronary artery bypass grafting; left main coronary artery; ST elevation myocardial infarction

Acute ST elevation myocardial infarction (STEMI) is dangerous, particularly when it involves the left main coronary artery (LM). This unusual case highlights the importance of early recognition, stabilization, and definitive treatment of this condition.

CASE PRESENTATION

A 78-year-old man without prior cardiac or other chronic medical conditions except untreated hypertension presented to the emergency department with several hours of substernal chest pain. On arrival, his chest pain was 6/10 and persistent, and his electrocardiogram showed elevation in the anterior leads, subtle elevation in lead aVR, and depression in leads 2, 3, and aVF *(Figure 1)*. He was loaded with 600 mg of clopidogrel, 325 mg of aspirin, and 4000 units of unfractionated heparin, and coronary angiography was performed through a 6 French right radial approach. The LM was narrowed 90% with plaque involving the ostia of both the left anterior descending and left circumflex coronary arteries *(Figure 2a)*. The remainder of the left coronary system and codominant right coronary artery were angiographically normal *(Figure 2b)*. The aortic pressure *(Figure 3a)* exhibited ventricularization upon engagement of the LM *(Figure 3b)*, also suggesting that the LM stenosis was hemodynamically significant. An intra-aortic balloon pump was placed via the femoral artery. Cardiothoracic surgery consultation was obtained with the patient on the table in the lab. It was decided that surgery to revascularize the left coronary system was both the safest and most expeditious way to treat him. The patient underwent urgent coronary artery bypass grafting (CABG) that evening, including a left internal mammary artery graft to the left anterior descending artery and a saphenous vein graft to the left circumflex coronary artery. He did well postoperatively without significant complications and was discharged from the hospital 6 days later. His ejection fraction by echocardiography prior to discharge was 45%, with improved anterior and apical hypokinesis compared to the preoperative left ventriculogram.

DISCUSSION

In patients with coronary plaque, it is rare to find stenosis of only the LM without any appreciable coronary disease in other territories.[1] The treatment for LM stenosis has traditionally been CABG, but more LM lesions are being treated with percutaneous coronary intervention.[2,3] In the setting of acute STEMI, percutaneous coronary intervention affords the most rapid resolution of symptoms and ischemia. Patients undergoing CABG in the setting of acute myocardial infarction are at higher risk for complications.[4] Percutaneous coronary intervention for STEMI involving the LM has been shown to be feasible and to reduce mortality and morbidity when compared to medical management, but

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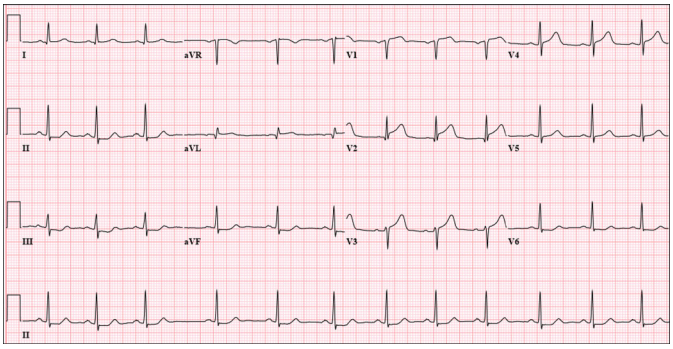

Figure 1. Subtle elevation of aVR is noted, with ST elevation predominantly in V1 and V2 and reciprocal changes (ST depression) in II, III, aVF. These findings are suggestive of a proximal left anterior descending or left main coronary artery stenosis.

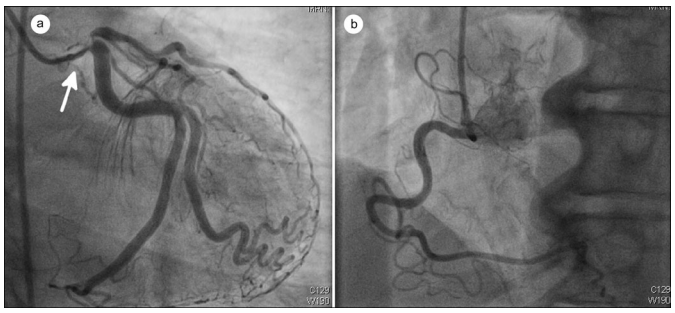

Figure 2. **(a)** High-grade stenosis of the left main coronary artery (arrow) with involvement of the ostium of the left anterior descending and left circumflex coronary arteries. Significant damping of the pressure was noted upon engagement of the Judkins left coronary catheter, also suggestive of a severe stenosis. **(b)** The right coronary artery (codominant) is free of significant disease.

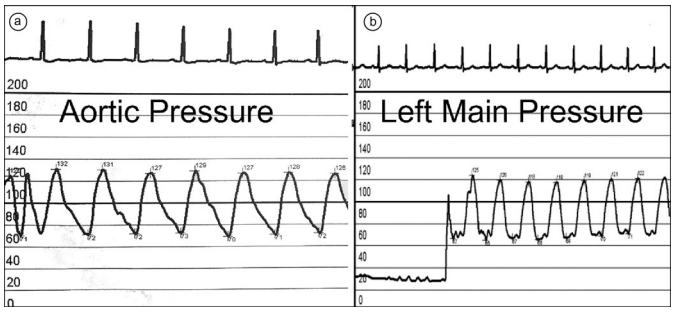

Figure 3. Pressure tracings taken from the Judkins left coronary catheter showing **(a)** normal aortic pressure prior to engagement of the left main coronary artery and **(b)** ventricularization of the pressure tracing upon engagement. This suggests that the orifice of the left main coronary artery is significantly reduced and that the stenosis of that artery is hemodynamically significant.

these patients are at higher risk for complications and death.[5–7]

The use of urgent or emergent CABG in STEMI is still considered a class I indication if angioplasty has failed or is technically challenging, there is anatomy suitable for CABG, and there is persistent myocardial ischemia or hemodynamic instability.[8] Studies indicate a higher risk of bleeding in patients undergoing CABG who receive clopidogrel or other platelet inhibitors and recommend (if possible) waiting several days between the initial antiplatelet medication load and surgery.[9] Antiplatelet therapy in patients with acute coronary syndrome who undergo CABG has not been associated with an increase in 30-day events but has been associated with a reduction in 30-day event rates.[10]

Patients with high-grade LM stenosis or occlusion are typically less stable, with a higher risk of deadly cardiac arrhythmias and shock and a higher mortality.[11] Recognition of LM involvement, based on the electrocardiogram prior to invasive evaluation, can pre-emptively change the cardiac catheterization strategy.[12,13] It is prudent to perform the fewest number of coronary injections needed in order to (a) make the diagnosis while (b) reducing the potential for catheter-induced ischemia and then (c) quickly formulating a strategy for treatment (i.e., revascularization strategy and/or mechanical support). If only a single angiographic picture is to be taken of the left system, it is often a right anterior oblique caudal view, because this is likely to give the most information regarding the LM, proximal left anterior descending, and left circumflex artery.[14]

If the patient is hemodynamically unstable or continues to have chest pain prior to urgent revascularization (either surgically or percutaneously), mechanical support (with an intra-aortic balloon pump or percutaneous left ventricular assist device) may be helpful in stabilizing the patient.[15–17] Placement of these devices requires additional time, so any foreknowledge that the patient might need them would be ideal. There are currently no clear advantages in the selection of the type of mechanical cardiac support device, but ongoing studies are looking at this question.[18]

Nonelective or reoperative status is a consistent risk factor for early mortality in virtually every study of CABG. That risk is generally higher with a presentation of acute myocardial infarction, with or without shock. The closer CABG is to the onset of myocardial infarction, the greater the risk of early mortality.[8] Therefore, urgent or emergent CABG is undertaken with caution and consideration of alternatives. In fact, a second surgical opinion (time permitting) is now the protocol for urgent CABG at our institution. In this case, with the patient's life "hanging by a thread," the benefit of urgent CABG clearly outweighed the risks.

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